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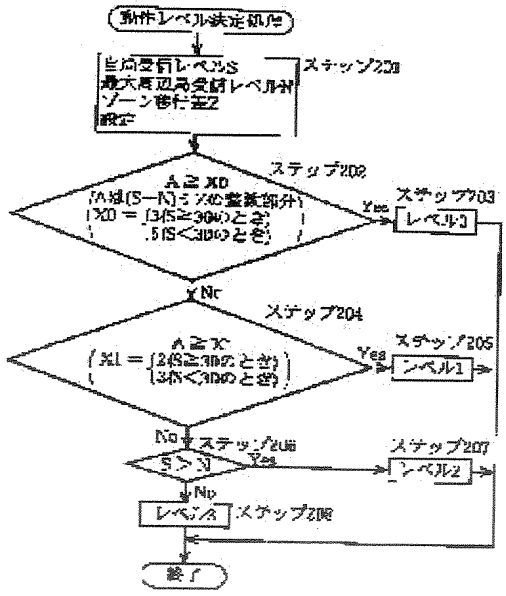
(54) WIRELESS TELEPHONE DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a portable telephone that conducts reception level measurement processing while taking balance between reduced power consumption and acquisition of a measured value with high accuracy into account.

SOLUTION: The wireless telephone device is a wireless telephone device that measures a reception level of a radio wave from a wireless base station being a current communication opposite party and that from other wireless base station, decides to which of operating levels 0-3 the reception level measurement processing is to be applied depending on a difference between a reception level S of its own station and a maximum peripheral station level N, reduces the power consumption by decreasing the frequency of the peripheral station reception level measurement at each operating level as the difference indicates a higher level, and increase the frequency of estimating the peripheral station reception level as the difference indicates a lower level so as to enhance the accuracy of the measured peripheral station reception level.



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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to amelioration of the intermittent reception actuation in a radio telephone equipment.
[0002]
[Description of the Prior Art] Radio telephone equipments (it is hereafter called a mobile station), such as PDC (Personal Digital Cellular), are measuring receiving level of the electric wave from a circumference station in parallel to measurement of the receiving level (RSSI, received field strength) of the electric wave from a local station, in order to judge whether it awaits and the zone shift to the wireless zone of other base stations (it is hereafter called a circumference station) of the base station inside or under communication link (it is hereafter called a local station) from a wireless zone is performed.
[0003] Drawing 11 is drawing for a mobile station to explain measurement actuation of the receiving level of a local station and a circumference office.
[0004] This drawing consists of a local station 1 (it sets to this drawing and is CS1) which is a base station as for which the mobile station (it sets to this drawing and is PS) and the mobile station are carrying out location registration, and circumference stations 2–5 (it sets to this drawing and is CS 2–5) which are base stations other than local station 1. this drawing –– setting –– a mobile station –– under the communication link with a local station 1 –– and it awaits, the receiving level of a local station 1 is measured for every predetermined period to inside, and it measures receiving level one game at a time in order about the circumference offices 2–5 for every predetermined period in parallel to this using the empty channel of TDMA (Time Division Multiple Access). More specifically, measurement actuation is repeated like a local station 1 and the circumference station 3 to a local station 1, the circumference station 3, and 3 period eye to 1 period eye at a local station 1, the circumference station 2, and 2 period eye. A mobile station measures a part for a term several rounds about the receiving level of each base station, and judges zone shift by making the arithmetic mean into measured value based on the comparison with the measured value of a local station 1, and the greatest measured value of the circumference stations 2–5. Generally, the measured value of a local station is compared with the greatest measured value of the circumference offices, the greatest measured value is larger, and when the difference is more than predetermined level, a zone shift judging is performed.
[0005] In receiving level measurement actuation, the mobile station is reducing power consumption by performing intermittent reception that turn ON a power source only at the time of receiving level measurement, and it turns OFF a power source in the other time zone. Generally in PDC, the period of intermittent reception is 720ms. That is, a mobile station turns ON a power source every 720ms, measures receiving level, and turns off a power source in the other time zone.
[0006] If the MSI (Mobile Station ID) knot electrical machinery style and fast scan device which DSPC (DSPC technology limited) developed and which are carried in DSP for mobile stations (Digital Signal Processor) are used in addition to this intermittent reception, the power consumption concerning measurement of the receiving level of a circumference office is further

the probability which carries out sone shift is so low that the difference of said receiving level is large, the power consumption which makes the frequency of circumference station measurement low and is built over measurement is reduced.
[0016]
[Embodiment of the Invention] Hereafter, the mobile station in the operation gestalt of this invention is explained using a drawing.
[0017] Drawing 1 is the block diagram of the mobile station 100 in this operation gestalt.
[0018] In this drawing, a mobile station 100 is a mobile station of PDC. Between the wireless section 12 and the wireless section 12 which perform conversion to the RF signal or RF signal from an intermediate frequency signal from an intermediate frequency signal, and the TDMA/TDD section 14, a QPSK (Quadrature Phase Shift Keying) strange recovery The modem section 13 to perform, the TDMA (Time Division Multiple Accsess) / the TDD (Time Division Duplex) section 14 which performs control by the Time Division Multiple Access, a microphone 16, and a loudspeaker 17 are minded. It consists of the speech processing sections 15 and the control sections 18 which perform voice coding decryption processing, magnification, etc. of the voice outputted and inputted.
[0019] A control section 18 consists of CPU19, ROM20, and RAM21, and it performs general communications control in a mobile station by performing the various programs CPUs19 are remembered to be by ROM20, and also it has DSP which is not illustrated, and in order to perform a zone shift judging, it performs receiving level measurement processing of a local station and a circumference station. In here, it is the base station of the under [a current communication link] or wireless zone by which it awaits, and is an inner base station, and a circumference station exists near the wireless zone of a local station like [a local station] a Prior art. The information about a circumference station is included in the control information transmitted from a local station.
[0020] a control section 18 -- under a communication link -- or it awaits, the receiving level of a local station is measured for every 1 super frame for 720ms to inside, and the receiving level of a circumference office is also measured in parallel to this. However, a control section 18 performs measurement processing from which the power concerning measurement differs about measurement of circumference station receiving level according to the difference of the size of local station receiving level, and the receiving level of a local station and a circumference station.
[0021] Hereafter, the receiving level measurement processing by the control section 18 is explained to a detail.
[0022] A control section 18 compares the difference of the receiving level of a local station and a circumference station, and performs receiving level measurement processing according to the positioned level of operation by positioning in either of two or more level of operation from which measurement power differs according to the difference. The power consumption which the receiving level measurement processing in each level of operation requires for measurement when the measuring method and measurement frequency of a circumference station differ from each other, respectively differs.
[0023] Drawing 2 shows the classification of level of operation.
[0024] As shown in this drawing, level of operation is classified into five steps according to the difference (it is hereafter called the electric-field difference between stations) of the size of the receiving level of a local station itself, and the maximum of the receiving level of a local station, and the receiving level of a circumference station. That is, when local station receiving level is 30 or more dBmuV, the electric-field difference between offices is 12 or more dBmuV, it is 8 or more dBmuV level 0 and less than 12 dBmuV, it is 0 or more dBmuV level 1 and less than 8 dBmuV, it is level 2 and less than [0dBmicrovolt] and it is level 3 and less than [-4dBmuV], it considers as level 4. Moreover, when local station receiving level is less than 30 dBmuB, the electric-field difference between offices is 20 or more dBmuV, it is 12 or more dBmuV level 0 and less than 20 dBmuV, it is 0 or more dBmuV level 1 and less than 12 dBmuV, it is level 2 and less than [0dBmicrovolt] and it is level 3 and less than [-4dBmuV], it considers as level 4. The power which receiving level measurement processing of level 0, level 1, and level 2 requires

dBmuV.
[0039] If Index A is more than threshold X1 as a result of a comparison, level of operation will be determined as level 1 (step 205).
[0040] When Index A is not more than threshold X1 in step 204, a control section 18 compares the size of the local station receiving level S and the maximum circumference station receiving level N (step 206).
[0041] As a result of a comparison, as for a control section 18, the local station receiving level S determines level of operation as level 2, when larger than the maximum circumference station receiving level N (step 207).
[0042] When the local station receiving level S is below the maximum circumference office receiving level N in step 206, a control section 18 determines level of operation as level 3.
[0043] A control section 18 determines level of operation as mentioned above, and receiving level measurement processing in each level of operation is performed. The receiving level measurement processing in each level of operation by the control section 18 is shown in drawing 5 – drawing 10 . In addition, about the transition to level detail measurement mode from level 3, the transition to level 4 from level 3 detail measurement mode, and the transition to level 3 from level 4, it is supposed that a control section 18 is not determined in this level decision processing of operation, but it will determine in another processing explained later.
[0044] Drawing 5 shows the flow chart of receiving level measurement processing of the level 0 by the control section 18.
[0045] In level 0, circumference station receiving level is in a condition quite lower than local station receiving level. That is, since the probability in which a mobile station 100 carries out zone shift at the time is in a very low condition, the height of the precision of circumference station receiving level is not required. Therefore, a control section 18 combines MSI power saving and a fast scan in level 0, and performs receiving level measurement processing that the power-saving effectiveness is the highest, in level of operation.
[0046] First, a control section 18 computes the local station threshold TH0 as initial setting in level 0, and makes it the threshold for MSI power saving (step 301). the local station threshold TH0 -- or (formula 2) (formula 3) considers as the one where a value is smaller inside.
(Formula 2)
TH0=S - (S-N) (/2)
(Formula 3)
TH0=S-Zx2.25 -- in here, the local station receiving level S, the maximum circumference station receiving level N, and the zone shift level difference Z are the same values as what was used in level decision processing of operation.
[0047] Next, a control section 18 measures the current local station receiving level Sp, when 1 super frame period (720ms) passes with the timer for intermittent reception (step 302) (step 303).
[0048] A control section 18 carries out the size comparison of the local station receiving level Sp and the local station threshold TH0 which were measured (step 304).
[0049] In step 304, when the local station receiving level Sp is larger than the local station threshold TH0, a control section 18 performs MSI power saving. That is, a control section 18 skips the fast scan for measuring circumference station receiving level (step 307).
[0050] On the other hand, when the local station receiving level Sp is zero or less local station threshold TH in step 304, a control section 18 measures circumference office receiving level with a fast scan. Let local station receiving level Sp which the control section 18 made maximum of the measurement results the maximum circumference station receiving level N, and was measured in step 303 here be the local station receiving level S (step 309).
[0051] Level decision processing of drawing 4 of operation is performed after that (step 310). In this level decision processing of operation, the local station receiving level S and the maximum circumference station receiving level N which were newly obtained in measurement processing of level 0 are used. That is, since level of operation will be determined using the more nearly newest receiving level, the dependability of a decision result is high.
[0052] When changing on level of operation other than level 0 is determined as a result of level

[0061] Thus, although detailed explanation is omitted since the procedure of level 1 is the same as the procedure of level 1 In short, a control section 18 has the local station receiving level Sp larger than the local station threshold TH1. And while the period when a fast scan is continuing being skipped continuously does not exceed timer T1 period, Repeat a skip of a fast scan and [whether the local station receiving level Sp is one or less local station threshold TH and] Or when the period when a fast scan is continuing being skipped continuously exceeds timer T1 period, a fast scan is performed, the maximum circumference station receiving level N and the local station receiving level S are updated, and level decision processing of operation is performed using the updated value.
[0062] Drawing 7 shows the flow chart of receiving level measurement processing of the level 2 by the control section 18.
[0063] The point of using the local station threshold TH2 instead of the local station threshold TH1 as compared with the processing of level 1 which showed processing of this drawing in drawing 6 , and the point used as the timer T2 instead of the timer T1 differ from the point of performing the usual scan which measures one circumference office at a time instead of a fast scan.
[0064] Moreover, the locations which reset the counter of the counter C for timers T2 as compared with processing of level 1 differ. That is, in receiving level measurement processing of level 2, although the counter is reset in step 508 after the size judging of the counter C for timers T2 of step 505, when the local station receiving level Sp is two or less local station threshold TH in step 504, a counter is not reset (in the case of level 0 and 1, a counter is reset to this timing.). That is, a control section 18 resets a counter, when it is not concerned with whether it is continuing or not not the count that skipped measurement of circumference station receiving level continuously but but the count of a skip exceeds a predetermined number (it sets here and is 4) (S508).
[0065] The local station threshold TH2 is expressed with (a formula 5).
(Formula 5)
The period of the TH2=S timer T2 is set to 720x4.
[0066] In level 2, the maximum circumference station receiving level N is in a condition slightly lower than the local station receiving level S. That is, the probability in which a mobile station 100 carries out zone shift at the time is higher than level 0 and 1. Therefore, the height of the precision of the circumference station receiving level for using for detection of zone shift is required rather than level 0 and 1. Then, the frequency where a scan is usually performed is made high by raising precision and making timer T2 period shorter than timers T0 and T1 by [which measure one circumference station in step 509 instead of the fast scan which was being performed by level 0 and level 1] usually scanning. Drawing 8 shows the flow chart of receiving level measurement processing of the level 3 by the control section 18.
[0067] When it determines that a control section 18 will change on level 3 from the level 3 detail measurement mode mentioned later when the local station receiving level S is judged in level decision processing of operation to be below the circumference office receiving level N, and when it determines to change on level 3 from level 4, processing shown in drawing 8 is performed.
[0068] In level 3, the local station receiving level S is in a condition lower than the maximum circumference station receiving level. That is, the probability in which a mobile station 100 carries out zone shift at the time is high. Therefore, since the height of the precision of the circumference office receiving level for using for detection of zone shift is required, in level 3, with a scan, a control section 18 measures the local station receiving level Sp and the circumference office receiving level Np of one game for every 1 super frame, and usually makes precision of circumference office receiving level high.
[0069] Moreover, in level 3, a control section 18 performs level decision processing of operation for every 1 super frame.
[0070] Furthermore, a control section 18 asks for the maximum circumference station receiving level N from the circumference station receiving level usually obtained by every timer T3 (=720msx15) with a scan, and when it is being judged and filled whether the maximum

[0081] Moreover, when the value which subtracted the receiving level concerning other base transceiver stations from the receiving level concerning the base transceiver station under current communication link is a forward value, said modification means is constituted so that it may become so frequent that the difference of the receiving level concerned is small and said frequency may be changed.
[0082] It is effective in the ability to be able to make circumference office measuring accuracy high by making the frequency of circumference office measurement high, so that the probability which according to this configuration carries out zone shift, so that power consumption is lessened when a radio telephone equipment lessens the frequency of circumference office measurement so that local station receiving level is higher than circumference office receiving level (i.e., so that the probability which carries out zone shift is low), and the difference of local-station receiving level and circumference office receiving level is small is high.
[0083] The radio telephone equipment of this invention is a radio telephone equipment which measures the receiving level of the electric wave from the base transceiver station under current communication link, and other base transceiver stations for a zone shift judging. Under a current communication link or the local station measurement means which awaits and carries out measurement in the partial different conditions of the receiving level of the electric wave from an inner base transceiver station, A circumference station measurement means to measure the receiving level of the electric wave from other base transceiver stations, The receiving level measured by said local station measurement means is compared with the receiving level measured by said circumference station measurement means, and it has a modification means to change the approach of said measurement by said circumference station measurement means into either of the measuring methods with which plurality differs, according to a comparison result.
[0084] Moreover, power consumption when the measuring method with which said plurality differs uses the measuring method for measurement, respectively differs, and said modification means is constituted [when the value which subtracted the receiving level applied to other base transceiver stations under a current communication link or from the receiving level which awaits and is applied to an inner base transceiver station is a forward value,] so that the difference of the receiving level concerned is large, and it may become a measuring method with little power consumption and may change.
[0085] According to this configuration, power consumption measures a radio telephone equipment using few measuring methods, so that local station receiving level is higher than circumference office receiving level (i.e., so that the probability which carries out zone shift is low), and it can be measured using a measuring method with much power consumption, so that the difference of local station receiving level and circumference office receiving level is small (i.e., so that the probability which carries out zone shift is high).

[Translation done.]

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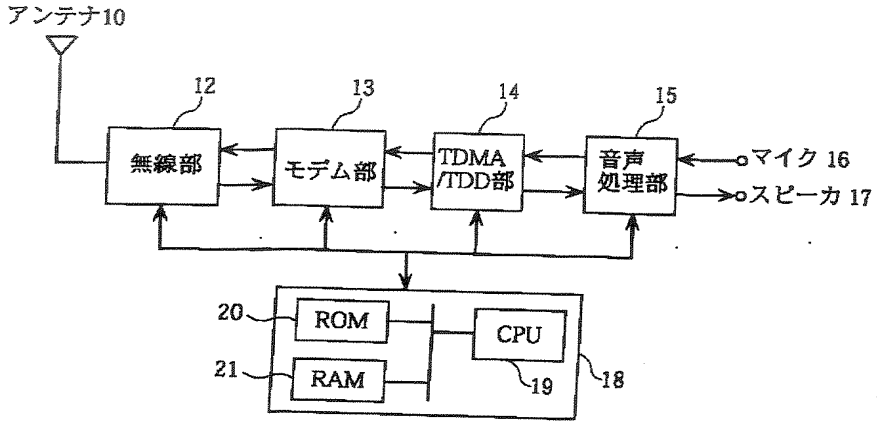
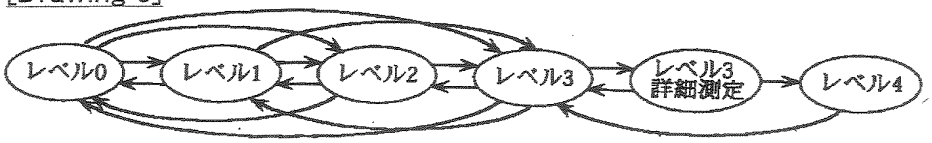


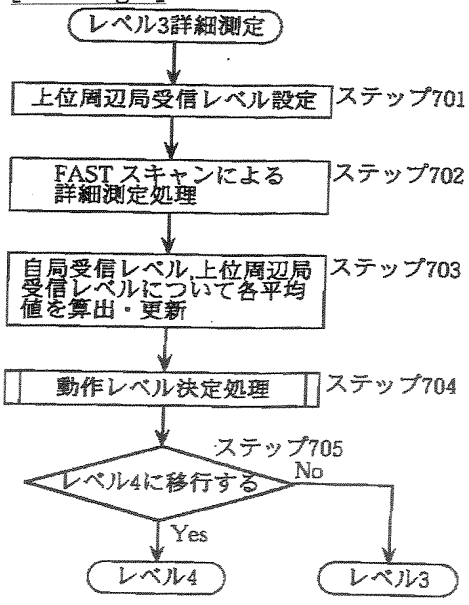
[Drawing 2]

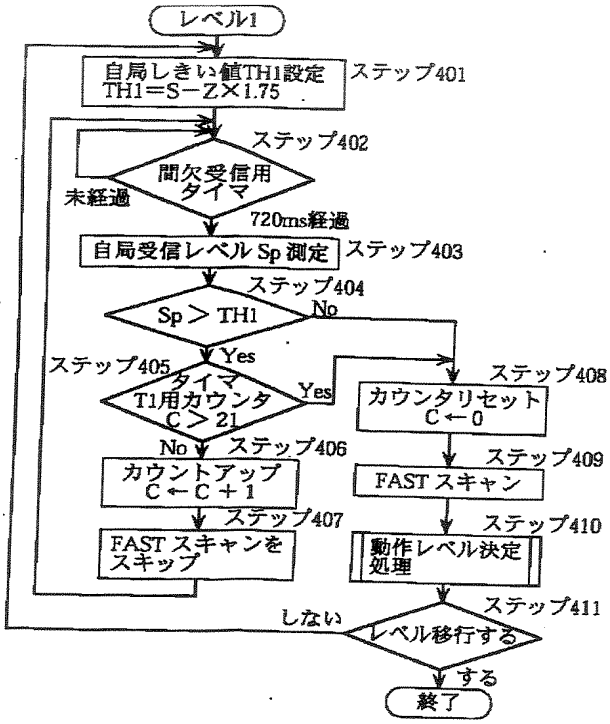
	局間受信レベル差 (自局電界値 ≧30dBμVのとき)	局間受信レベル差 (自局電界値 <30dBμVのとき)
レベル0 (省電力動作強)	12dBμV以上	20dBμV以上
レベル1 (省電力動作中)	8～12dBμV	12～20dBμV
レベル2 (省電力動作小)	0～8dBμV	0～12dBμV
レベル3 (省電力動作なし)	0dBμV未満	0dBμV未満
レベル4 (省電力動作なし)	－4dBμV未満	－4dBμV未満

[Drawing 3]

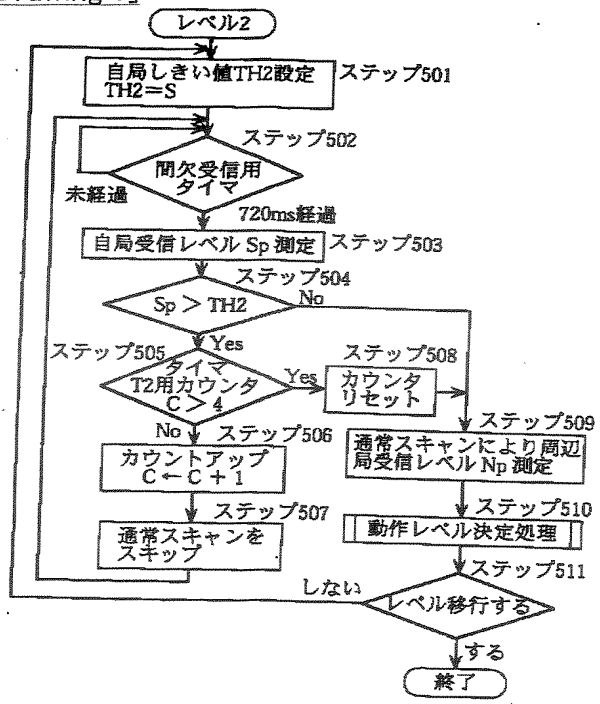


[Drawing 9]





[Drawing 7]



[Drawing 8]

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